#7

Marsh Effluvia

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Of Marsh Effluvia

The Chemical nature of Marsh Effluvia, and the manner in which it operates on the system in producing the various forms of disease, which are refered to it as their cause, are subjects of great importance to Physicians; because if its Chemical qualities, or nature could be clearly discovered, the antidote would be obvious by means of which its deleterous effects might be prevented, or the Miasmata decomposed and destroyed: & in case its Chemical nature could not be discovered, if the particular mode of its operation on the system could be ascertained, it would be advancing a step towards discovering the means whereby its effects on the animal economy might be ~~prevented~~ counteracted, & thus the various forms of disease which it produces prevented or their severity & fatality lessened.

In the frequent attempts which have been made to analize the infectious atmosphere, but little discov-

discovery has been made as to the unequivocal nature of Miasmata, or the substance, or substances of which it is composed. Different men have been of different opinions as to its real nature, some supposing it to be one thing, & some another. Oxigen by its powerfully stimulating action has been supposed to be the active agent. Hydrogen gas has been considered the noxious cause of disease. Dr Clark supposed it to be a compound of Hydrogen & light. Sulphuretted Hydrogen gas, & also Azotic gas have been considered the active agents in producing disease.

As to the modus operandi of Marsh Effluvia on the system, Dr Cullen believed it produced disease by a sedative operation. Dr Rush says Yellow fever may be cured by stimulus, if the stimulus be stronger than that which produces the disease.

Dr Potter says M. E. acts as a stimulus sui generis, first on the Brain, through the medium of the nerves, then on the system generally & particularly on the Stomach & Liver. Notwithstanding the

diversity of opinion on the subject, both as to its chemical nature, & modus operandi on the system in producing disease; Physicians generally agree in referring its origin to vegetable putrefaction, and the decomposition of water. But the products of vegetable putrefaction are so imperfectly known, and so little has been discovered by Chemical analysis, or observation, that nothing satisfactory has been adduced on the subject.

In the process of vegetable putrefaction & the decomposition of water, Hydrogen — Carbureted hydrogen — Sulphureted Hydrogen — Carbonic Acid — & Nitrogen gases are all known to be produced. In addition to these a number of other adventitious substances may exist in the infectious atmosphere, dependant on the kind or variety of vegetables, & chemical quality of the water decomposed. As these gases are known to be evolved by putrefaction, & as they have all by different persons been considered the noxious agent in producing disease; each one deserves so much attention as to ascertain

what experience & observation has disclosed, relative to its chemical nature, & effects on the system when inspired.

Of Hydrogen gas. This gas is known to be unrespirable & incapable of supporting combustion. Its specific gravity is about ~~1/5~~ of that of the atmosphere. From its extreme levity it ascends so rapidly after it is extricated that it is more than probable it does not exist low enough in the atmosphere to be respired.

Carbureted Hydrogen gas is a substance which deserves more particular attention from what is known of it. It is produced in abundance in ponds of stagnant water, & may easily be obtained from them

When procured from stagnant water it is found to be combined with carbonic acid, & atmospheric air. In its pure state it is without taste or smell, & its specific gravity is .555. to atmospheric air as 17 is to 30. As it passes off from the stagnant water it is so mixed with Carbonic acid gas, & common air, that its gravity is much greater. It is the gas which explodes

in such abundance from some coal mines, & which has long ben the dread of miners under the name of fire damps. This gas is irrespirable & will not support combustion. Its specific gravity is so much less than that of atmospheric air, that it would tend to ascend, but from the quantity of Carbonic acid gas, & air in combination with it, it is most probably retained near the surface, & especially in the morning & evening when there is moisture in the air, with which Carbonic acid is so disposed to combine. From this view of the subject Carburetted Hydrogen is no doubt respired in greater or less quantities.

Sulphuretted Hydrogen gas, is that which produces the offensive smell sometimes perceptible in marshes It does not support combustion. Animals cannot breath it without suffocation. Its specific gravity to common air is as 1.1912. is to 1.000. Consequently it exists near the surface of the earth; & as it is rapidly absorbed by water it probably exists principly in that combined state.

Of Carbonic acid gas. This gas is produced in considerable quantities. Its specific gravity is 1.527. It is also irrespirable.

Nitrogen gas, is produced by the combination of Oxigen with Carbon in the process of putrefaction. In this process the Atmosphere is not only deprived of a portion of Oxigen, its respirable & vivifying principle, but it is contaminated with the compound thus formed, (Carbonic acid gas) and also with the Nitrogen gas set free.

Nitrogen gas is elastic like common air which it resembles in its mechanical properties. Its specific gravity is to Atmospheric air as 0.9722. is to 1.000. Possessing the mechanical & other properties of common air, & so nearly approaching it in specific gravity, a portion of it is evidently inhaled with the respirable air in respiration. When respired alone experiment proves that animals if compelled to continue in it, die in a very short time precisely as they would if plunged under water.

From this particular view of the gases it seems probable that Hydrogen from its extreme levity is not liable to be inhaled, except as it is ascending when produced in large quantities. When animals are compelled to inhale it they soon die precisely as they would if plunged under water. Their death is occasioned merely by depriving them of Oxigen.

Carburetted Hydrogen & Nitrogen gases are the substances which most contaminate the atmosphere. They are produced in marshes in large quantities, & from their specific gravity & mechanical ~~practices~~ properties, not only exist in the strata of air that is respired, but they are also so intimately blended with it, that they are unavoidably inhaled with it in respiration. They both when respired produce death immediately. The former is said to produce a specific change in the blood. This change most probably consists in a higher than ordinary state of carbonation of the blood, from the superabundance of carbon in the air inspired coming in contact

contact with the air cells of the Lungs, & preventing the necessary effect of Oxigen in removing the redundant carbon from the Blood. The blood consequently would continue to retain its carbon, & perhaps be imbued with an increased quantity of it.

In addition to its effect in this way, it measurably excludes by its specific gravity, the oxigen from the Lungs, & thus prevents its necessary effect on the nervous system.

Nitrogen gas, is supposed to act by excluding Oxigen from the Lungs. The Specific gravity of Carbonic acid gas is so great, that it remains too near the surface of the earth to be inhaled, except that which is rendered light by mixture, as Carburetted Hydrogen gas, which has already been considered.

Conducted by the feint light afforded by observations, & Chemical experiment, the investigation so far has not been so difficult, as it is unsatisfactory. But to go into a full investigation of the Modus operandi of Marsh Effluvia on the system, would require the sub-

subject, & respiration to be considered at large; as
Marsh Effluvia seems to act through that medium, either,
1. On the nerves primarily, or,
2. By preventing the necessary effects of Oxigen on the blood, & then through the medium of the blood on the nervous system from being produced, or
3. By entering into combination with the blood & imparting to it noxious properties. In one of these ways, or in all of them, it most probably produces the deleterious effects on the system.
1. When presuming Marsh Effluvia to act primarily on the nervous system its impression must first be produced on the Olfactory nerves, & the nerves of the Lungs, & be conveyed secondly, through the nerves to the Brain; & thirdly, its effects must be distributed from the Brain, by nervous communication, to every part of the system diseased: or,
2. If it acts by preventing the necessary effects of Oxigen on the blood, it most probably produces its morbid effects

on the system in a negative manner, by excluding oxigen from the Lungs, & thus preventing the oxigen, either from combining with the Carbon of the blood & conveying it off in the necessary quantity to keep the blood in a healthy state, or from producing any other effect on the blood necessary to health. The blood not being properly renovated in the Lungs would cease to afford the ordinary & necessary stimulus to the system.

3. We have supposed Marsh Effluvia may affect the system by imparting to the blood noxious properties. The products of Vegetable putrefaction, which we have learnt to constitute Marsh Effluvia, all produce death immediately when inspired by animals. Part of them are supposed to produce death negatively by excluding oxigen, as the animal dies just as it would if plunged under water. Those gases that are constituted principly of Carbon are said to produce a specific change in the blood. May they not in addition to excluding oxigen from

the Lungs, & thus preventing the Carbon from being removed, imbue the Blood with more Carbon?

As part of the gases which result from vegetable putrefaction are found to be deleterious, when inspired by a negative operation on the system; & as the other part most probably produced the change, which is found to take place in the Blood, by increasing the redundance of Carbon, the conclusion must be, that Marsh Effluvia produce their morbid effects on the system by excluding Oxigen from the Lungs; & thus preventing it, from producing,

1. The effect on the nerves, & through that medium on the Brain, supposed to be produced by some physiologists; and

2. The necessary changes on the Blood by removing the redundant Carbon. But,

3. From this conclusion <u>Marsh Effluvia</u> impart no noxious properties to the Blood, but prevent the noxious principle generated in the system from

being removed. In confirmation of these conclusions respecting the nature & modus operandi of Marsh Effluvia on the system a general view of the subject of respiration, & the effects of Oxigen (the active principle in respirable air) on the system will be important.

Therefore without entering at all, into an investigation of the different Chemical, & Metaphysical theories which at different times have been adduced on the subject of respiration; we will consider it in the way indicated by the latest discoveries.

From experiment it is now clearly proven, that when pure atmospheric air is inspired a portion of its Oxigen is lost, before it is expired. The quantity of Oxigen consumed by a man in 24 hours, is found to be about 46.000 Cubic inches. It is also ascertained that the air thrown out of the Lungs contains in it a quantity of Carbonic acid, which did not exist in it previous to its being used for respiration.

The bulk of this gas is considered about equivalent

to the oxigen consumed. As the above quantity of oxigen is found by experiment to be consumed in respiration; and as the quantity of carbonic acid gas thrown out from the Lungs is equal or nearly equal to the quantity consumed, The conclusion is that the oxigen combines with the carbon of the blood, & thus forms the carbonic acid gas. Oxigen gas will combine with carbon so as to form carbonic acid without any change in the volume of the oxigen gas. The quantity of carbon carried out of the blood, through the Lungs, in this way, is found by experiment to be about ¾ of a pound in 24 hours.

The atmospheric air then, is found to lose by respiration, a portion of oxigen gas the volume of which is supplied by carbonic acid gas.

Before proceeding to consider the changes produced in the blood by respiration, it is necessary to observe that these effects of respiration on the air, are not only various at different times, and in different persons, but they are also varied by particular subs-

substances taken internally. Drs Prout & Tyson found by experiment, that alkohol & all fermented liquors diminish the proportion of Carbonic acid formed by respiration. They found also that when the system is affected by mercury the proportion of Carbonic acid gas in the air expired is diminished. Dr Tyson found that the quantity was likewise diminished by a course of Nitric acid, & by a vegetable diet. [more as to the importance of these facts in the sequel]

The changes produced in the blood by respiration, are; 1. It acquires a florid red colour & the Chyle disappears, 2. It loses a portion of Carbon and 3. It emits water. [Thomsons Chemistry pag. 472 of vol. 4] The first effect resulting from respiration is that which produces the most obvious difference between venous & arterial blood. This change from a dark to a red colour, may be explained in part by a chemical effect of the air inspired on the blood; as venous blood when exposed to common air out

of the system undergoes the same changes: Carbonic acid gas being formed, & Oxigen absorbed, as in respiration. Venous blood when exposed to Oxigen gas, has the same effects produced, much more speedily & in a higher degree. No change takes place in the colour or sensible properties of venous blood, when exposed to Nitrogen gas; neither does any change take place in the gas.

The blood not only acquires a florid, red colour in the Lungs, but the Chyle entirely disappears, after it circulates through the lungs. Now Chyle is the substance of which blood is formed; but the process of blood making cannot take place in the Lungs exclusively. The Chyle circulates with the blood in the vascular System, and the assimilation probably in part is thus produced. But Chyle contains no fibrin, & the waste which is produced in the muscular part of the system, by exercise cannot be repaired but by fibrin. Before the Chyle, or part of it, can be changed into fibrin

a portion of the Carbon must be abstracted from it. This effect is produced on the fluids in the Lungs. Now unless the Carbon be removed the process of assimilation must not only cease, but a great redundance of Carbon will be produced in the blood. If the assimilation of Chyle & formation of fibrin be checked, by the redundance of Carbon; it follows as an evident consequence that the system will be debilitated as the waste taking place in it from its natural functions, and from exercise cannot be repaired. This debility will be most evident in the parts most remote from the source of the circulation, & where the effects of the redundant Carbon is greatest, as in the capilary ramifications of the veins, and in the Vena portarum where the circulation goes on slow, & is easiest impeded. Dery, if the the Carbon which is generated so rapidly ~~be not regularly~~ in the system at the rate of ¾ of a pound pr day, be

not regularly removed through the medium of the Lungs, may it not produce a tendency to putrefaction in the fluids? Vegetable and Vegeto-animal liquids in a saccharine and crude state, such as the Chyle and unassimilated blood are in, if they be of the proper temperature, are disposed to run rapidly into a state of fermentation, & putrefaction.

This tendency to putrefaction seems to depend on the quantity of Carbon crude & saccharine fluids contain, as when the carbon passes off in the process of fermentation, in the form of carbonic acid gas, the component parts of the liquid are assimilated & the tendency to fermentation ceases. But if by any particular circumstances, or state of the fluid, this effect of fermentation is prevented; the liquid instead of undergoing such changes as would free it from any tendency to fermentation, is decomposed, & passes into the putrid state.

As the unassimilated blood, is similar in

its qualities to crude Liquids, Gas in the healthy state to Carbon is incessantly combining with Oxigen & passing out of the blood through the medium of the Lungs in the form of carbonic acid gas, may not the functions of the Lungs from their effect in this respect, be compared to ~~fermentation~~?

The one completes the assimilation of the blood, the other assimilates a crude fluid tending to putrefaction. All this would be more obvious if the blood were not under the vital, or living influence of the system. In some cases of disease their is such a tendency in the fluids to putrefaction, that soon after death the whole body becomes putrid. This tendency to putrefaction is checked by the living powers of the system while after death. The,

2. Change produced in the blood by Respiration is the removal of the redundant Carbon, amounting upon an average to ¾ of a pound a day.

This we have found is produced by that portion

of oxigen lost from the air in respiration, combining with the Carbon of the blood in the Lungs & conveying it off, in the form of Carbonic acid gas.

3. Water is emitted by respiration from the Lungs

This transpiration from the lungs is a fluid somewhat similar to that thrown out of the body by insensible perspiration from the skin. They are both most probably peculiar secretions answering the double purpose of keeping the parts moist & dissipating redundant fluids.

But these changes produced in the blood are not the most important effects of Respiration.

The temperature of all animals depends upon it.

The manner in which animal heat is generated in the Lungs & conveyed throughout the system has been very ingeniously explained by D^r^ Crawford.

He found that the capacity of arterial blood for caloric, was so much greater than that of venous blood, that all the caloric evolved by the

Oxigen in its combination with Carbon, was thus rendered latent; & that the blood in its routine of circulation through the system, gradually gave out this latent heat, as it become changed from arterial to venous blood.

We have now taken a general view of the gaseous products, of vegetable putrefaction, which constitute Marsh Effluvia, both as to their chemical nature & modus operandi on the system in producing disease: & in confirmation of the opinions advanced, we have found, that certain effects must be produced on the system through the medium of respiration, or the economy of health will be destroyed. In the atmosphere rendered infectious by vegetable putrefaction, we have also found unequivocal evidence to believe, that gaseous substances exist, which are known by experiment to prevent those effects on the system from taking place, which are produced by respiring pure air, and which are incapable of sensibly

necessary to health.

From all these circumstances taken in connection, we are led to conclude that Marsh Effluvia consist in a superabundance of Carbonaceous & other adventitious substances, in the gaseous state in the atmosphere, which act negatively, by diminishing the relative quantity of Oxigen in the air respired, & thus preventing the necessary effects of Oxigen gas on the system from being produced. Carbonaceous gases in addition to their negative effect may imbue the blood with carbon, as they are said to produce a specific change in the blood.

The changes which are produced in the system by respiration, are effected principly by the removal of Carbon from the blood by the Chemical agent, Oxigen gas.

Then as Marsh Effluvia produce disease by preventing the Carbon from being removed from the blood, & the other changes from taking

place, consequent, on its removal; it remains to be explained how this redundance of carbon in the system produces a disease, so various in its forms, & yet so characteristic in its generic symptoms.

To throw some light on this part of the subject, as well as on the nature of Marsh Effluvia, I will give a brief history of a peculiar case, which came under my observation, & which afforded the data, from which assisted by subsequent reading, observation, & reflection, I have predicated the present theory of the cause of the disease produced by Marsh Effluvia, of its Pathology, & of the cure

The Case

The subject of the present Case was (my Father) David Shanks Esq. Resident in Botetourt County Virginia. He was possessed naturally of a robust & healthy constitution. At the age of 32 or 33 he exerted himself so violently lifting in an inc-

inclining posture that he sensibly felt something break or give way in his chest, he immediately recovered away from the injury. After he recovered from the concussion, though much disabled he exposed himself without caution to the vicissitudes of the weather.

During the violent exertion there was no pressure against his breast. Therefore it is more than probable that from a full inspiration, & the great distension of his chest to give energy to his exertions, he ruptured some of the Bronchial tubes.

However be this as it may, a violent inflammation took place in his Lungs, attended with a great degree of fullness, and tension in the chest. & such difficulty of breathing that it was necessary to support him in an erect posture.

These symptoms finally abated from the application of blisters to the chest. He had a severe cough, but not much expectoration. After the acute symptoms disappeared, the peculiarity of his case become manifest in a continuation

of the tension, and apparent inferiorness, particularly of the right lobe of his lungs, though without the extreme sensibility of the accute stage. The parieties of the right side of his chest gradually sunk in, and become more fixed than natural. The usual motion of respiration was changed. In his full inspirations, instead of the Sternum & anterior part of his ribs rising equally & regularly, the Ribs, of his left side only, were elevated in any considerable degree; the right side bro down conformed to their elevation by sinking in, as the Abdomen does in a full natural inspiration, when the sternum is regularly elevated

His situation in short seemed to be this, from the intensity of inflamation the air cells of the right lobe of his Lungs had united, by means of the coagulating lymph thrown out; or the Bronchial tubes of the right side from the injury, and the subsequent inflammation had become so inferior as to prevent the air ~~from passing into the~~

air from passing into the right lobe; the consequence of which was, a collapsed state of that lobe of his lungs

The demand on the other lobe was increased, the action of the left intercostal muscles, was increased also

The right lobe ceasing to expand, the action of the right intercostal muscles was diminished.

This state of his chest was obvious to any observer, and the surprise of the many physicians whom he consulted, all confessing they never had seen a parallel case. From this state of his lungs he could not exercise himself violently without producing symptoms of suffocation. Particles of dust floating in the air affected him much more than other persons. But the greatest peculiarity in the case, was the remote effect of this state of his lungs on the health of his system. Nature is studious in all her works in adapting one part exactly to suit the demands of another. In this case by accident the functions of part of a very

important organ in the system were destroyed
The natural consequence of which was,
the defect must be made up in some way, or
the system must suffer. The defect though
local was considerable, as from every ap
pearance nearly one half of the lungs was
rendered inactive, & incapable of performing
the function of respiration. Notwithstand=
ing this was the state of his lungs, when the
weather was dry and temperate, by a regular
and easy course of life, which he observed, he
enjoyed tolerable health for a number of years
But when the atmosphere was cloudy
damp and cool, and he was at all exposed
he felt languor oppression about the precordia
great sensibility to cold & all the symptoms to
be described presently though in a mild degree
With this brief history of the accident, the
destruction in, & peculiar state of the organ
of respiration produced by the accident, we

peps on to the last years of his life, when the symptoms become more urgent from the decline of his constitution.

He lived about 27 years after the accident, in a salubrious country situation, & in that way which was most conducive to his health. During the last years of his life particularly, in the fall, winter, & spring seasons of the year, when the atmosphere would become cool, cloudy, damp & heavy, or in other words, when from an increase of moisture in the atmosphere condensed by the cool air, the ordinary quantity of oxigen gas was prevented from coming in contact with the lungs in respiration, that does when the air is pure, dry, and most fit for respiration; his whole system was sometimes powerfully affected. Nothing is more common than to hear healthy persons, in the above state of the atmosphere, complain of feeling heavy & dull; produced no doubt from the necessary quan

of oxigen on the system, not being produced from the above cause. This being a known fact in healthy constitutions it requires but little effort of the imagination to conceive, that much greater effects would be produced in a person who under the most favorable circumstances for respiration, could with caution but just support the regular functions of life. Though it is easy to conceive, that such defective respiration would produce peculiar symptoms, yet it would be difficult to point them out, without an example of the kind.

When the changes in the atmosphere above described would take place, the first apparent effect on him would be evinced by, languor, lassitude, indisposition to motion, increased sensibility to cold, want of appetite &c.

The paroxisms generally came on in the morning. They were preceeded by drowsiness, increased sensibility to cold, a shrinking of

the whole body, Corrugation of the surface, fee-
ble circulation in the extreme vessels, fullness
in the head & Chest, the surface of the body had
a pale & bluish cast, and the blood in the
cutaneous veins had a preternaturally venous
appearance. [Vide Wistars Anatomy pages 70 to 80 Inc
Vol. 2.] All these symptoms gradually increa-
sing, finally he become chilly, and was affected
with pain in his head, back, Breast, Groins &
extremeties; sickness of his Stomach, & some-
times vomiting, great fullness & oppression in his
breast, and dificulty of breathing: When he was
not ~~too~~ too much disturbed by the vomiting,
or distress, he frequently lay in a torpid
~~state~~ muttering delerious Sentences; but when
his attention was called up by questions, his
answers were always correct, probably from
the influence of habit, as, after the paro-
xism, when violent, he sometimes could rec-
ollect nothing that had occured during it.

The cold stage of the paroxism, after continuing about as long as in intermittent fever was succeeded by the hot stage. About the time the reaction took place he was generally affected with great oppression, ~~[illegible]~~ anxiety and violent coughing attend with a considerable expectoration of viscid phlegm. The hot stage was very similar to that in intermittent fever, except more anxiety & difficulty of breathing generally. The hot stage always ended in a general determination to the surface of the body by which the excitement was equalized, & in the last years of his life it generally went off by profuse perspiration.

It is evident from this description of the paroxisms that they were very similar to the paroxisms of intermittent fever. He had occasionally paroxisms of this kind from the time of the accident until his death; though for several years after the accident they were

seldom so severe as to produce much inconveniences. For 12 or 15 years before his death they were occasionally as violent as above described, but they became more frequent as his constitution declined. From an attack of Pleurisy, succeeded by Bilious fever, three years before his death, the functions of his system were so impaired, that the effects of imperfect respiration which before only produced pectoral distress under particular circumstances, & the atmosphere, afterwards become a constant cause of the paroxisms. I have known him during the last two years of his life, sometimes to have a paroxism more or less severe every day, for several days; sometimes to have one every other day for several days; & sometimes to labour for several days under oppression, anxiety, cough &c., evidently proceeding from a redundance of blood oppressing the vital organs; & then to be relieved by a violent paroxism, which would produce such

reaction as to force the fluids to the extreme vessels. During the last two years of his life, there seemed to be a constant tendency in his system, to paroxisms of the kind above described, of the Tertian intermit. This state of his system was attended with an incredible secretion of Bile. The above description would lead to the opinion, that his disease was common Intermittent fever: But he lived in a neighborhood where there was no cases of the kind, for ten miles, & he never had intermittent fever, from the ordinary cause.

Having thus, briefly described the symptoms aggregately, which he suffered for a number of years, I will endeavor to give some idea of the effects of remedies, & of the opinions, as to the cause of the symptoms.

Traveling had the effect of bracing up his system & in this way proved advantageous. Cold wet & other seemed most conducive to this effect when the atmosphere was dry. In addition to this a

regular, temperate course of living was observed. But when his constitution began to decline, hastened by the imperfection of his Lungs the symptoms became urgent. He then resorted to medical remedies. Physicians differed in opinion as to the nature of his disease. Some supposed it to be similar to intermitent fever, though they could not account for the symptoms, & their obstinate continuance. As he always had more or less cough during the paroxisms, & was very much troubled with cough, when the premonitory symptoms of a paroxism would continue two or three days, before its complete accession; some physicians ascribed all the symptoms, to an affection of the Lungs, & considered them of the Hectic kind, produced by an absorption of matter from the Lungs; of which however, there was no evidence as he never expectorated matter, but viscid white phlegm, & when it was relieved from the effects of Opiates it came away in a concocted

form, or in the state of mucus. Some physicians were surprised, that he had survived the injury so long.

I had every opportunity to observe his situation, both during the paroxisms & intermissions for a number of years while the symptoms were seldom so violent. When I began to acquire principles from which to reason scientifically, & reflected that he had, had exactly similar symptoms though less violent, & less frequent, from the time of the accident; I immediately came to the conclusion, that they were not as had been supposed of the Hectic kind, & produced by matter in the lungs, or an absorption of matter from the lungs; for had this been the case, his system would soon have sunk under the disease. This theory vanishing before the test of reflection, I started from the well known fact that healthy persons during the same state of the atmosphere that affected

him, complain of the same symptoms, as lethargy, dullness, heaviness &c., only in a less degree. Attributing this lethargic state in healthy persons, to the unrespirable state of the atmosphere, I immediately concluded that the defect produced in the organs of respiration by the accident, would greatly increase these symptoms in him, as there was imperfect respiration in addition to an unrespirable state of the atmosphere. Knowing the harmony of Nature in forming one part exactly to suit the demands of another in all the work she completes, & knowing also that this proportion of parts had been deranged by accident and disease, the symptoms manifestly appeared to result from imperfect respiration.

To discover how the system could be affected by imperfect respiration, so as to produce the symptoms which took place in this case

I investigated the subject as I have done in this Dissertation, so far as the experiments, and discoveries of scientific men have explained it. From this investigation I found, that one indispensible effect of respiration, was to remove the redundant Carbon, amounting to about 3/4 of a pound in twenty four hours, from the blood. One Lobe of his lungs being collapsed, & apparently inoperative to the ingress of air, though in such a state as not to prevent some circulation of Blood through it, convinced me that this effect of respiration on the blood, with all the other effects on the systems dependant on it, as the production of animal heat, assimilation &c. could not take place to the extent necessary, to preserve the health of the system. From these considerations, deduced from the manifestly defective state of his lungs, & the consequent imperfect respiration, I concluded that the re-

necessary quantity of Carbon was not removed from the blood by respiration; and finally that the symptoms were produced by a superabundance of Carbon in the system.

These conclusions have led us insensibly to the very point to which we had arrived in the investigation of the subject of Marsh Effluvia

In this case we found the defect in the organs of respiration was such as to prevent the necessary effects of respiration on the system from being produced; In the case of disease produced by Marsh Effluvia, we found the state of the atmosphere was such as to produce the same effects.

Further to apply this case in explanation of the nature, & modus operandi of Marsh Effluvia & the pathology of the disease produced by it, we will take a view of the effects produced by the redundance of Carbon in the system. Thus, 1. We have the dark colour, or venous state of

the blood, depends on a redundance of Carbon in it. Hence the bluish appearance of the surface of the body, & dark or preternaturally brown appearance of the blood in the superficial veins at the commencement of Suffusion.

2. We believe animal heat is afforded by the Calorific given out in the combination of Oxygen with Carbon in the lungs. This not taking place in the necessary degree accounts for the sensibility to cold &c., which would be felt first at the surface of the body, or in the parts most remote from the heart & Lungs.

3. We found in investigating the subject of respiration, that a certain quantity of Carbon must be abstracted from the Chyle, before it can be assimilated & applied to the support of the system. The Chyle passes through the Lungs soon after it enters the circulation for this purpose, and if this effect is not accomplished, the system cannot receive

its necessary support; hence the lassitude & debility of the system.

4. We have reason moreover to believe, that Oxigen in ordinary healthy respiration, produces a stimulant effect on the system; this conclusion we are supported in, from the exhilarating effect of Oxigen gas, & nitrous Oxide gas, when respired; this facts accounts for the dull and lethargic state of the system. If the above conclusions be correct, neither the necessary stimulus of Oxigen gas in respiration, nor the necessary nutriment from the aliment taken in, would be imparted to the system. Further we know that Venous blood is not only darker, but thicker or more dense than arterial blood; Is it not more than probable that the dense or venous state of the blood, would retard its circulation, & prevent it from affording the necessary stimulus to the heart, the blood vessels, the Glandular organs of Secretion &c. All these facts taken

together go very far in explaining the manner in which the premonitory symptoms of a paroxism are produced. Then the cause of these symptoms being explained, by keeping it in view, & tracing its increasing effects on the system, we may account for all the symptoms of a paroxism. — We found a cause for the particular appearance, or cast of the countenance — for the increased sensibility to cold — for the languid & lethargic state of the system — for the retarded & feeble circulation in the superficial vessels, attended with corrugation of the surface, shivering of the body &c. These symptoms then being gradually increased by the cause, the shock to the system producing feeble circulation, chilliness &c, would give rise to all the phenomena of the cold stage of a paroxism. In the cold stage of fever the distribution of blood in the arteries & veins is unequal. The blood moreover retires from the superficial into the deep seated veins, & from

these again into the grand venous reservoirs of the interior; so that it is especially accumulated in the Spleen, the Liver, (the Vena Portarum) about the right side of the Heart & its large Vessels. This State of the circulation forming what we call the cold stage, could not continue without the destruction of the System: But the preternatural accumulation of venous blood, attended with a preternatural contraction of heart distends the heart, & large vessels & excites them into increased action; By this increased action, termed the reaction of the System, the hot stage is brought about; or in other words by the stimulus of congestion, & the increase of internal heat consequent on it, such excitement is produced as to distribute the blood throughout the system. [Vide Armstrong on Typhus, Lond. Amer. Edi. page 285.] That consequent on the internal congestions, there is an increase of internal heat we are induced to believe from the great desire

for cold drink, about the time the reaction takes place.

The hot stage is the natural cure for the cold, and is produced by the accumulated blood & heat in the internal parts, being distributed to the external, by the action of the heart & large vessels.

The heart, & lungs being oppressed by the accumulation of blood about them, is the cause of the great oppression, anxiety & difficulty of breathing which sometimes exists during the reaction. When the reaction is complete & the excitability of the system is somewhat restored, the capillaries resume their natural functions, & the preternatural heat is removed by profuse perspiration; And thus the sweating stage is the natural cure for the hot stage.

In fine the hot, & sweating stages are produced by the salutary efforts of the system, to remove the effects of the cold stage.

I have now given a history of the symptoms

of this case, & advanced the opinion that they were produced by imperfect respiration; which I have endeavoured to support, by a fair investigation of the cause, & an explanation of its effects.

Presuming from the symptoms of this case, that no person will deny that it was a disease similar to Intermittent fever; & presuming further that no one will dispute the cause of the symptoms assigned, it requires but an easy transition from this case, to the cases of Disease produce by Marsh Effluvia, to explain its nature, & modus operandi on the system, in producing disease.

We have already sufficiently insisted on the fact, that the same superabundance of carbon will be produced in the system, when the atmosphere is rendered imperfectly respirable by Marsh Effluvia, (or Carbonic acid gas,) as was produced in the case adduced by the imperfect

State of the Lungs. The dyspnoea of the above case being so exactly similar to those produced by Marsh & Howard; & the cause of the dyspnoea being the same, differing only in the circumstance of one being in the lungs & the other in the atmosphere, but both producing the same effect, seem to afford conclusive evidence of the identity of the cases.

Further to substantiate the doctrine I have advanced, & to shew that it has almost forced itself upon the observations & experiments of physicians, biased by other notions, I make the following quotations. (Rushes Enquiries Vol. 4. pages 107 & 108.) About the time says Dr. Trotter when notice was taken of the putrefying Coffee on the wharf at Philadelphia, in the year 1793., a Captain of a man of war just returned from the Jamaica Station, informed me, that several Casks laden with the same produce, came to Kingston from St.

Domingo during the distracted state of that Colony, this article with other productions had been allowed to spoil & putrefact. The production of a great quantity of fixed air, or Carbonic acid gas was the consequence; & in those holds when opening the Hatchways, such were its concentrated state the whole of the crew in some of them was found dead on the deck." [Hospers Medical dictionary page 511. Art. perspiration.]

"The constituent principles of the perspirable fluid seem to be 1. water, attenuated into vapor by the matter of heat. 2. Animal gas or Carbonated Hydrogen, as the production of carbonated air with the Oxigen of the atmosphere shews. 3. Azotic gas, For water in which a man has bathed soon becomes putrid. Carbonated Hydrogen Chemically combined with Azote, would appear to constitute putrid Miasmata. May not this be the origin of putrid fever in those narrow confined Chambers in

which there are many persons?"

From these facts established by experiments made on the matter of perspiration Dr Hooper was led to a disposition, which not only favors the doctrine I have advanced, but very much of touches it. It is well known if respiration be carried on to a considerable extent where the air is confined, that the oxygen is consumed & its place is supplied by Carbonic acid, & Nitrogen gases. Now may not this infectious state of the confined air, imbue the system with materials, from which by vascular action, the genuine contagion of Typhus fever is formed, and thrown out of the body, with the excretions? This idea seems exactly to accord with that quoted from Hooper, which is founded on experiments. This disease being peculiar to the winter season, is it not probable, that in addition to the Contagious, & infectious state of the

confined air, that Cold, by its sedative operation, may assist in ~~producing~~ the low type of Typhus fever?

Leaving the contested subject of contagion and returning to Marsh fever, we presume that its remote cause, & the remote cause of the dysenteries, ~~of the dysenteries~~ of the case detailed, have been identified; & further, that the manner in which its effects in one case are produced, has been explained, by its effects in the other. Further to substantiate the doctrine advanced I might adduce the opinion of Cullen in proof of the sedative operation of Marsh Effluvia, for which I have contended. In explaining the phenomena, & proximate cause of fever, Dr. Cullen observes "As the hot Stage of fever is so constantly preceded by a cold stage, we presume that the latter is the cause of the former; & therefore that the cause of the cold Stage is the cause

of all that follows in the course of the paroxism". He then supposes, that a general debility, induced in the system by the remote cause, is the cause of the chill.

So far Dr Cullen supports our doctrine both as to the operation of Marsh Effluvia, & the explanation of the phenomena of Fever: But instead of the proximate cause being spasm of the extreme vessels, we have supposed it to be a congestion of the fluids in the internal vessels, attended with an increase of internal heat, which affording a preternatural stimulus to the heart & large arteries disturbs them & produces such excitement as to develope the phenomena of the hot stage of fever. This effect is increased from the accumulation of excitability in the system.

This internal congestion, or engorgement of the vessels takes place in the vessels of the stomach, Liver & Spleen as well as the

parts; & when the heart is excited these organs are excited also. Hence the vomiting which takes place during the cold stage, & which ceases generally so soon as the reaction produces the congestion; & hence the increased secretion of Bile which takes place during a paroxism; & hence moreover the enlarged & diseased state of the Spleen so often produced by protracted Intermittent fever.

As we have objected to Spasm of the extreme vessels being the proximate cause of fever, we will endeavour to explain what we conceive the state of the extreme vessels to be, to which Dr. Cullen has applied the term Spasm.

With this view we may observe that the surface of the body is tenser, redder, hotter & more sensible than is natural, & thus resembles a part affected with inflammation. The phenomena of inflammation

have induced some late pathologists to assert, that it depends on debility of the part, instead of increased action; or that the remote cause produces debility, which forms the predisposition to inflammation, & this local debility, or predisposition, acted on by the proximate cause, which is the natural, or an increased action of the heart & large vessels, gives rise to the distension of the vessels, the congestion, or accumulation of blood, & the preternatural heat & redness indicative of inflammation. Thus we have four series, two causes & two effects. The remote cause produces the predisposition, which is local debility, & the proximate or exciting cause, developes the phenomena of inflammation. This false pathology of inflammation, we will endeavor presently to shew, corresponds exactly with our doctrine of Fever.

But to apply it to our present purpose, in explaining the state of the extreme vessels, & the surface of the body, in the hot stage of fever, it will be necessary to premise something of the anatomy of the skin. Dr Baynham has proven by injection ~~that~~ that the Cutis Vera is composed of two lamellæ, & that the external lamella is vascular. On this the perspirable matter is most probably secreted.

Towards this surface of the cutis, the pores of the Cuticula project like the fingers of a glove, & come in contact with it, where they take up the perspirable fluid, & admit that to enter which is taken in by the absorbents. — Then by the remote cause of fever we suppose the capilary vessels of the cutis, (as well as the whole system) are contracted. The increased action of the heart & arteries propelling the fluids to the extreme vessels

causes the debilitated capilary Vessels to expand, & they are thus changed from the secretories of the fluid of perspiration, to receptacles of red blood. This dilatation of the extreme vessels not only stops the secretions of the skin, but presses the conical pores of the Cuticula upon themselves, so as completely to close them. That this is the case we infer from the phenomena corresponding so exactly with those which take place in a part of the surface when affected by Erysipelas, in which the Cutis is inflamed. In Erysipelas the outer lamella of the Cutis is inflamed, the little conicle processes, or pores of the Cuticle are pressed back upon themselves, forming a kind of valve, which prevents the fluid of perspiration from being discharged, hence it is poured out forming little vesicles, sometimes more especially in the face

there is swelling, redness &c. but no vesicles.

It may be asked, why are not these vesicles formed in fever? We would say because the remote cause of fever acts with so much greater force than that of Erysipelas, that by the exciting cause the vessels are too much expanded to secrete the latitus of perspiration.

That this is the case we infer from the different effects of stimulents applied externally. The gentle stimulus of cantharides increases the secretion, but the more penetrating stimulus of mustard, checks it, by producing inflammation. We are further confirmed in this opinion, by the phenomena which occur in certain malignant fevers, as the plague, yellow fever &c., in which the remote cause acts with such force as to weaken, or paralise the capilary vessels so much, that the blood itself becomes effused under the cuticle, & thus forms

Petechia.

We have now endeavored to explain all the important phenomena of fever as they are developed in a paroxism of Intermittent fever. To give more explicitly our doctrine of Marsh fever, We would say the remote cause, acts on the system in the different ways we have already explained, & thus produces a general debility in the system. This debility forms the predisposition to disease. — Cold, fatigue fear, Inanition &c. act as concomitant causes with Marsh Effluvia in producing this state of debility. This state of debility gives rise to a recession of the blood, from the superficial to the internal vessels, & to the collapsed & shrunk state of the exterior vessels, attended with tremors &c.; to a congestion of blood in the internal vessels; & to an accumulation of vital ability in the system.

The congestion of blood in the interior of the

system, with its consequent increase of heat, affords a preternatural stimulus to the heart & large vessels. This preternatural stimulus acting on the accumulated excitability of the system, causes the heart & large arteries to develope the phenomena of fever; or the hot stage of a paroxism, which is the only stage that the appelation, fever, can be applied to with propriety; the other stages being the predisposition to & effects of the fever. As in our definition of Inflammation we had four series of causes & effects, so in our definition of fever we have four also.

To exhibit explicitly our doctrine of Marsh fever, we will give the following syllabus.

1. Marsh Effluvia alone, or assisted by debilitating causes, as cold, fatigue, fear, starvation &c., produce a state of debility, & increased excitability. (Causes which act by a stimulant operation, & thus produce indirect de

debility, may also be taken into the account.

This State, of debility, & increased excitability, is,

2. The predisposition to fever. This predisposition gives rise to internal congestions, and preternatural internal heat; which,

3. Form the exciting cause of Fever. The exciting cause acting on the increased excitability of the heart & large arteries, causes them, to dilate,

4. The phenomena of fever.

Though our definitions, of fever & inflammation seem so perfectly, to corroborate each other, an important practical distinction must be made. The remote cause of inflammation produces the same effect that the remote cause of fever does, viz, Debility, which is the predisposition to both; but in inflammation the predisposition is local, in fever it

is general; In inflammation, the natural, or an increased action of the heart & arteries, acting on local debility, and increased excitability, is the proximate cause.

In Fever the predisposing debility, & increased excitability are general. The congestion & internal heat which form the exciting cause, disturb the heart & large arteries, & thus produce the morbid action throughout the whole vascular system which in inflammation is local.

This doctrine of fever & inflammation points out with almost mechanical certainty the general indications of cure.

If there be local inflammation without preternatural action of the heart, local depletion so as to empty the weakened, & distend vessels, & then Tonic & stimulating applications to cause them to contract & resume their natural energy, is all that is necessary. If the local inflam-

inflammation be accompanied, or kept up by a preternatural action of the heart & large vessels, then the above means must be assisted by general depletion so as to naturalize the action of the heart. In fever the morbid action is general, though it may be ~~may~~ vital, the depletion also must be general, until it is subdued. Then Tonics, (when necessary,) used with caution cause the vessels to resume their regular & healthy action.

When local predispositions exist in the system, or when intermittent fever is neglected, or improperly treated, it sometimes changes into Remittent, & then into continued fever, & terminates in death.

In these cases the remote cause continuing to act on the system, it becomes so debilitated that the heart & vital organs become incapable of throwing off the blood, which is congested in them. Therefore the proximate cause which before only acted periodically, now becomes

a constant excitant to the vascular system.
Though congestions of blood in a greater or less degree constantly exist, yet the salutary efforts of the heart & large vessels, remove in some measure the congested blood, & thus procure a remission, which continues until the congestions again take place, when the system again reacts. The reaction of the system thus becoming weaker & weaker, & the congestions increasing, the conservative efforts of the system, become almost imperceptible, & are finally extinguished. When intermittent fever terminates in this way, the first paroxisms rarely terminate completely by perspiration, & some deep seated uneasiness almost always exists during the interval, indicating a morbid state of the Brain, or some of the visera of the body, or both.

Allowing this to suffice as to the pathology of Marsh fever, we will consider more par-

particularly the indications of cure.

The similarity between the case I have detailed & Intermittent Fever is further confirmed by the effect of Medical treatment.

In that case the paroxisms could be prevented by mine & Bark, until from use it lost its effect on the system. Blisters applied to the extremities so as to keep up the circulation in them, would also prevent the paroxisms.

By exciting the mercurial action in the system, the paroxisms were prevented while this action was kept up. As to the Modus operandi of Mercury in this case, it seemed to act by producing an inflamatory diathesis in the system; & probably it acted also, by increasing the excretions, & thus in some degree, supplying the place of respiration by enabling the system to throw off through the medium of the excretions Carbonaceous matter. We have found from the experiments of Dr. Lyle that less

Carbonic acid gas is thrown off from the lungs when the system is affected by mercury than when it is not. We have also found in the quotation from Dr. Rush, that Carbonaceous gases are carried out of the system with the fluid of perspiration. These facts at least go to increase the probability of the opinion advanced.

Leaving over the subject of Intermittent, I will make a few observations on Bilious Remittent fever as it occured in the flat country adjacent to the Roanoak river in Botetourt Cty. Va.. In addition to the flatness & fertility of the country, contiguous to the river, in the sickly neighborhood there are several marshes. These sources of Marsh Effluvia assisted by a mill pond, which was frequently drawn off during the summer season for the purpose of fishing, & then allowed to fill up after the dam had acted on the bed, gave rise to a disease the autumn of

1821 which was more fatal than any disease ever before witnessed in this country. Nearly all the members of some families fell victims to it. The physicians from its appearance too type treated the disease principly with stimulants.

As an introduction to the consideration of the disease as it occured the last season (1822) I will give a general idea of the weather from spring till autumn. — The spring & summer until July were unusually warm & wet, so that vegetation was forward & luxuriant. A drouth commenced about the 15th of July & continued until the last of September. During which time there was no rain worth speaking of, except one hasty Thunder Storm about the 25th of August.

About the first of July 8 or 9 Cases of Bilious Intermittent & one of Bilious Remittent fever occured, not very distant from each other

From the first of July, until the 10. or 12 of August the cases continued to increase in number, generally of the Remittent form.
But about this time the drought was so great, that Vegetable decomposition was checked, for the want of moisture. From this, or some other cause, the disease declined, until a few days after the Thunder Storm on the 25th, when cases occured more malignant than before.

The attack was generally preceded, one, two, or more days by premonitory symptoms.

These symptoms were succeeded by coldness of the extremities, & sensations of Coldness running up the back, & in some cases chillness

The cold stage was attended with pain in the head & back, fullness & obtuse pain in the Epigastric, & hypocondriac regions, Anxiety, yawning, stretching &c. The cold stage was succeeded by fever, attended with

an increase of the pains, anxiety, restlessness
&c.

Dr. Knush was in company with me, when I first saw the case of Bilious Remitent fever mentioned above. He immediately pronounced it a dangerous case, of the same fever, which prevailed the preceding Autumn. The woman who had the fever, was about 20 years old. She had been ill 5 or 6 days. When we saw her, she lay in a state of great prostration. Suffered great anxiety, & pain in her back, breast & head. Her pulse was weak & quick, the whole surface of her body was cool, & covered with sweat, her mouth was dry, her tongue foul, eruptions on her lips, & her stomach so irritable as to eject almost every thing swallowed. During her illness before we saw her, she had been bled, & the morning before we saw her she had taken a dose of salts the salts had purged off Green bile. The woman

of the blood they told us was green.

From these symptoms I concluded, that the excitability of the system, was concentrated in the Viscera, that congestions had also taken place, which produced the Oppression, the irritable state of the stomach, the increased secretion of Bile, also the relaxed state of the surface, the torpid or feeble circulation in the capilaries, the coldness of the extremeties.

Directed by this pathology, we prescribed warm applications, & sinapisms to be applied to her extremeties, also a Blister over her stomach to invite the energy of the Brain which was morbidly distributed to the Viscera, to the surface. The blister would relieve the irritability of the stomach also. In addition to these remedies, we prescribed Cal. in repeated doses sufficiently large, to evacuate the Bile in the first

place, & in the second to produce its alterative effects on the system. When Mercury is absorbed into the system, we presume it acts especially on the excretory organs as it is passing out. In this way by its secondary operation, it stimulates the Salivary glands, the Liver, the Kidneys, the bones of the body, or the excretory organs by which the perspirable matter is thrown out of the body &c.; & thus the excitement is translated from the vital organs, to less vital parts. By this effect of mercury, the excitement is not only translated to parts less immediately connected with life, but it is excited in parts from which, (instead of the organic derangement, which the disease produces in the vital organs,) a discharge can take place, & is produced; which, when produced soon enough, or before the vital organs are impaired, or

the system is too much prostrated, will rarely fail to produce a Crisis, & relieve the system of the unequal, & morbid excitement, which otherwise would most probably destroy the patient.

The course of treatment above laid down was persisted in with attention, & in 8 or 10 days she was convalescent, without the assistance of Tonics or Stimulants, except infusion of Serpentaria.

The following I conceive to be the general indications of cure, in the different stages of fever.

1. In the predisposition to fever, we know a state of debility exists in the system. This debility is not disease, & in itself deserves no concern, but its effects, as internal congestions &c., are what we are to obviate. To do this, the patient should first be removed out of the influence of the remote cause.

Then temperance, and avoiding all causes which may produce either direct, or indirect debility, assisted by gentle depletion from the bowels by Laxatives, & if necessary from the vascular system by Venesection, so as to take off part of the pressure of the blood, & thus relieve the enervated heart & arteries, will prevent the fever.

2. As in the predisposition to fever, the indication is to prevent the predisposition from giving rise to the proximate cause; so when the proximate cause is formed, the indication is, to prevent it from producing fever. To do this, depletion is necessary from the Bowels, & sometimes from the blood vessels. With this view in bilious remittent fever, I prescribe large doses of Hydrargyre & antibilious purgative medicine, so that they may operate freely about the time, or before the reaction commences. When the internal heat, & reaction, produce thirst, aspidity &c. I allow the

patient to drink cold water alone, or medicated with some of the saline Laxatives.

Cold, in this state of the system, by abstracting heat, & by its peculiar effects on the system has a powerful effect in restoring the natural action of the system. In this way it seems to promote the operation of purgatives at this stage of fever. If these means are not sufficient to remove the congestions, & prevent violent reaction, when the reaction takes place, I open a vein and abstract blood, until the heart is completely freed, from the exciting cause of its turbulent action, which I determine from the pulse.

Thus the predisposition to fever, may be removed, & fever in its forming state, and after it is formed, may be arrested. But in practice difficulties are presented when the patient has suffered two, three, or more violent paroxisms without mitigation

and when his system is almost exhausted.

In this stage of violent Bilious Remittent fever, the patient is found in a state somewhat similar to the case described, & sometimes worse. The pulse small, weak, & frequent, though sometimes it is slow — The surface cool, fullness in the Epigastric & hypochondriac regions, sickness of the stomach & vomiting, anxiety &c. In this state of the system the energies of life, remaining in the extremities, that the surface should be revived, & cherished by warm applications, & in urgent cases mercurial frictions. If the stomach be very irritable a blister drawn over it will be advantagious;

But that the Blister may produce the necessary effect, Calomel should be premised in pretty large doses, repeated so as to evacuate the Bile in the stomach & bowels. When the bile is completely evacuated, Calomel combined with Ipecac. & sometimes Opium so as to diffuse it through

the system, & thus speedily, to produce its stimulent & alterative effects in the system equalizes the excitement & thus produces a crisis

This combination of remedies seems to have a particular action on the Capilaries. The calomel should be discontinued so soon as its alterative effects are discoverable, lest it produce salivation, which would counteract its stimulent effect & salutary effects by the debilitating effect of the discharge thus produced.

If the prostrated state of the system demand it, any of the stimulents which circumstances may render preferable, may be used with the above remedies. But in a majority of cases when the calomel operates, so as to free the alimentary canal from its loaded & depraved state, the system immediately becomes invigorated, & rises from its great prostration.

The pathology of Bilious Remitent fever

and the course of treatment which I have briefly laid down, has enabled me to treat a disease with nearly complete success, which last season was a terror to the people, as it carried with it the besom of destruction.

In about 65 Cases of the different grades from mild bilious Remitent, to Violent Bilious remitent & continued fever, for which I prescribed, before the precursors of death supervened my remedies, but two died. Their deaths occured under very unfavorable circumstances.

Without saying any thing of the exhilarating effects on the feelings of a young practitioner, of this success, & the prospects of future success, in wielding the implements of the profession, so as to controll, so deleterious a disease, we will conclude with one more reference to our doctrine of Marsh Effluvia, as the remote cause of disease.

Preliminary to this let us for a moment

contemplate the works of nature, recall their various forms and trace these to their source. Here we find the elementary principles of which they are formed to be few & simple. A certain quantum of elementary principles exists, & these by passing through different changes & combinations, constitute all the various appearances, and spontaneous productions which nature affords. Part of these elementary principles constitute the atmosphere which affords the pabulum of animal & vegetable life, & supports combustion. The atmosphere, from these spontaneous operations, undergoes perpetual changes; one principle is abstracted from it, and another is supplied.

Thus respiration, combustion, fermentation &c. abstract Oxigen, & return Carbonic acid gas.

Vegetation absorbs the carbonic acid gas, decomposes it & returns the Oxigen; & thus the necessary equilibrium in the atmosphere, or the

component parts, is harmoniously preserved. During the Spring season if there be any disproportion, from the luxuriance of vegetation an excess of Oxigen is supplied to the atmosphere. Oxigen being the vivifying principle to the animal economy, produces a gently cordial & stimulating effect on the system.

Hence the exhilarating influence of the pure Spring breeze, Hence the diseases which prevail at this season are generally inflammatory, or of the Synocha form, as pleurisy Catarrh &c. In autumn when vegetation begins to decay & ferment, then a superabundance of Carbonaceous gases is evolved, which seem to constitute, Marsh Miasma & produce the disease which we have described. The evolution of carbonaceous gases is finally checked by the cold weather, which checks the putrefaction of vegetables.

Viewing the subject in this way it appears to

obviously, that different seasons giving rise to a greater, or less luxuriance of vegetation, & to circumstances of heat, & moisture, more or less favorable to their putrefaction, would through the medium of the atmosphere be differently salubrious to the people.

Add to these considerations that of the various chemical operations, which are constantly going on, in the bowels of the earth, by which the atmosphere in particular places, or even neighborhoods, may be contaminated, & they afford a kind of preludium to the explanation of the Epidemical constitutions of the air, Anticipated by the illustrious Sydenham, & others.

But here at the threshold of this important investigation, we lay aside our pen, until the path becomes more illuminated.